CLAIMS

What is claimed is:

1. A liquid catalyst mixture receptacle comprising:

a receptacle body having a first wall with a vertical portion and an angled portion;

an air inlet to the receptacle body through the first wall, the air inlet being spaced from the vertical portion of the first wall by the angled portion such that if air bubbles are released into a catalyst mixture in the receptacle body from the air inlet, the air bubbles do not contact the vertical wall portion of the first wall before reaching an upper surface of the catalyst mixture; and

an opening in a wall of the receptacle body for releasing sparging gas from the body.

2. The liquid catalyst mixture receptacle of claim 1, wherein the air inlet opening is horizontally spaced from the vertical portion of the first wall by a distance of approximately 1/4 inch or greater.

3. The liquid catalyst mixture receptacle of claim 2, wherein the air inlet opening is horizontally spaced from the vertical portion of the first wall by a distance of approximately 5/8 inch or greater.

4. The liquid catalyst mixture receptacle of claim 1, further comprising a chamber in communication with the opening in the wall, the chamber having a plurality of cross-sectional plane areas parallel to the opening, the opening in the wall having an area smaller than a largest area of the cross-sectional plane areas.

5. The liquid catalyst mixture receptacle of claim 1, wherein the wall opening has a dimension of approximately 1/4 inch or greater.

6. The liquid catalyst mixture receptacle of claim 5, wherein the wall opening has a dimension of approximately 5/8 inch or greater and a dimension of the largest of the cross-sectional plane areas is approximately 1.5 inch or greater.

7. The liquid catalyst mixture receptacle of claim 1, further comprising a check valve in fluid communication with the air inlet.

8. The liquid catalyst mixture receptacle of claim 7, wherein the check valve comprises a buoyant stopper sized and shaped to block the air inlet if liquid rises above a stop level in the air inlet to permit air to flow around the stopper if liquid does rise above the stop level in the air inlet.

9. The liquid catalyst mixture receptacle of claim 8, wherein the check valve further comprises a sealing gasket disposed about the air inlet such that the buoyant stopper contacts and creates a sealing engagement with the sealing gasket to block the air inlet if liquid rises above the stop level in the air inlet.

10. The liquid catalyst mixture receptacle of claim 1, wherein the body of the receptacle includes a reinforcing indentation in a wall thereof, the reinforcing indentation being oriented and positioned such that the receptacle body may be strapped to a vehicle by aligning and seating a strap upon the reinforcing indentation.

11. A liquid catalyst mixture receptacle comprising:
a receptacle body having an opening in a wall thereof;
an air inlet to the receptacle body; and
a chamber in communication with the opening in the wall, the chamber having a cross-sectional area larger than an area of the opening.

12. The liquid catalyst mixture receptacle of claim 11, wherein a dimension of the opening in the wall is approximately 1/4 inch or greater.

13. The liquid catalyst mixture receptacle of claim 12, wherein a dimension of the opening in the wall is approximately 5/8 inch or greater.

14. The liquid catalyst mixture receptacle of claim 11, further comprising a check valve in fluid communication with the air inlet.

15. The liquid catalyst mixture receptacle of claim 14, wherein the check valve comprises a buoyant stopper sized and shaped so as to block the air inlet if liquid rises above a stop level in the air inlet to permit air to flow around the stopper if liquid does not rise above the stop level.

16. A liquid catalyst delivery system comprising:

a liquid catalyst receptacle having an air inlet and an outlet; and

a catalyst transport for transporting catalyst particles in a sparging gas to a flame zone of a combustion process, the catalyst transport comprising:

a first sparging gas transport path coupled to the receptacle outlet and configured to transport sparging gas at a first rate; and

a second sparging gas transport path coupled to the receptacle outlet and configured to transport sparging gas at a second rate in response to an increase in demand for catalyst at the flame zone.

17. The liquid catalyst delivery system of claim 16, wherein the first sparging gas transport path comprises a pump coupled to the receptacle outlet, the pump configured to pump the sparging gas from the receptacle outlet at the first rate.

18. The liquid catalyst delivery system of claim 17, wherein the second sparging gas transport path comprises a check valve configured to open to sparging gas flow therethrough in response to pressure on a side of the check valve exceeding a predetermined threshold pressure.

19. The liquid catalyst delivery system of claim 16, wherein the first and second transport paths join into a joined transport path configured to transport the sparging gas from the first and second transport paths, and wherein the second transport path is configured to transport catalyst only when vacuum pressure in the joined transport path exceeds a predetermined threshold pressure.

20. The liquid catalyst delivery system of claim 16, wherein the first rate is a variable rate.

21. The liquid catalyst delivery system of claim 16, wherein the second rate is a variable rate.

22. The liquid catalyst delivery system of claim 16, further comprising a catalyst transport control coupled to the catalyst transport and configured to regulate flow of sparging gas through at least one of the transport paths.

23. The liquid catalyst delivery system of claim 16, further comprising a catalyst transport control configured to monitor catalyst transport and relay catalyst transport information to a remote location.

24. The liquid catalyst delivery system of claim 23, wherein the catalyst transport information comprises an indication that a predetermined threshold of operation has been reached.

25. The liquid catalyst delivery system of claim 16, further comprising a mounting plate coupled to the receptacle and a vibration source.

26. The liquid catalyst delivery system of claim 25, wherein the vibration source comprises a pump.

27. The liquid catalyst delivery system of claim 16, wherein the receptacle comprises an air inlet opening positioned and oriented such that air bubbles released into a catalyst mixture in the receptacle from the air inlet opening do not contact a solid object before reaching an upper surface of the catalyst mixture.

28. The liquid catalyst delivery system of claim 16, wherein the receptacle comprises a chamber in communication with an opening in a wall of the receptacle, the chamber having a cross-sectional area larger than an area of the opening.

29. A method of providing catalyst to an air intake for a combustion process, the method comprising:

sparging air through a liquid catalyst mixture in a receptacle to produce sparging gas;

transporting the sparging gas from the receptacle at a first rate before transporting the sparging gas from the receptacle at a second rate higher than the first rate when demand for sparging gas at the air intake exceeds a predetermined threshold.

30. The method of claim 29, wherein the second rate is a variable rate.

31. The method of claim 29, wherein the variable rate corresponds to a vacuum pressure caused by air moving through the air intake.

32. The method of claim 29, wherein transporting sparging gas at a first rate comprises pumping the sparging gas with a vacuum pump.

33. The method of claim 29, wherein transporting sparging gas at the first rate comprises transporting sparging gas through a first transport path and transporting sparging gas at the second rate comprises transporting sparging gas through both the first transport path and a second transport path.

34. The method of claim 33, wherein transporting sparging gas at the second rate comprises opening a valve to allow sparging gas to be drawn through the second transport path by a vacuum caused by air moving through the air intake.

35. A method of sparging air through a catalyst mixture to produce a sparging gas, the method comprising:

bubbling air through a catalyst mixture in a receptacle;

transferring catalyst particles to an air space above the catalyst mixture to produce a sparging gas; and

transporting the sparging gas within the receptacle at a first velocity toward a receptacle outlet, then transporting the sparging gas within the receptacle at a second velocity less than the first velocity toward the receptacle outlet, then transporting the sparging gas within the receptacle to the receptacle outlet.

36. The method of claim 35, wherein transporting the sparging gas within the receptacle at the first velocity, then a second velocity, then to the receptacle outlet comprises passing the sparging gas through a chamber between a body of the receptacle and the receptacle outlet, the chamber having an opening with an opening area smaller than a maximum cross-sectional area of the chamber.

37. The method of claim 35, further comprising releasing bubbles into the catalyst mixture from an inlet structure having a vertical portion and an angled portion, the angled portion horizontally spacing the released bubbles from the vertical portion

such that the bubbles do not contact the vertical portion before they reach a surface of the catalyst mixture.

38. The method of claim 37, wherein releasing the bubbles comprises releasing the bubbles away from any vertical surface.

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